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ALPINE PHYSIOGRAPHY.

Die Gletscher der Ostalpen. Von Dr. Eduard Richter. Mit sieben Karten, zwei Ansichten, und vierundvierzig Profilen im Text. (Stuttgart: J. Engelhorn, 1888.)

The Alps. By Prof. F. Umlauft, Ph.D. Translated by Louisa Brough. With 110 Illustrations. (London: Kegan Paul, Trench, and Co., 1889.)

THE first of these two works—an elaborate memoir of 306 pages—forms the third volume of the "Handbücher zur Deutschen Landes- und Volkskunde," issued by the Centralkommission fur wissenschaftliche Landeskunde von Deutschland. About one-sixth of the whole is occupied by some preliminary remarks, and a discussion of the snow-line and the methods of estimating it. As the author points out, this expression is a rather vague one, and in a later part of the book he indicates that it may be or has been used in four different senses: (1) the lower limit of the patches of *firn* or *névé*, which chiefly depends on the steepness and ruggedness of the mountains; (2) the lower limit of the connected permanent fields of snow and ice, excluding the glaciers which descend from them, which may be called the practical snow-line,—this depends mainly on the nature of a declivity and its aspect; (3) the "climatic' snow-line, a theoretical estimate of the snow-line arrived at by considering climatic factors only; (4) the normal snow-covering, estimated by the line up to which the snow melts away from the mountains. In proportion as the mountains become regular in form, the first, second, and fourth approach one another, and tend to coincide with the third, and all must be considered in arriving at a general estimation of the snow-line for any mountain group.

The author then passes in review the various districts of the Eastern Alps, and enters into details as to the distribution, arrangement, levels, and limits of the snow-fields and glaciers. In this section of the work a large amount of statistical information is collected, which, together with the references to the literature, cannot fail to be of much value to anyone engaged upon questions relating to climate, and especially investigations bearing upon glacial geology.

In the concluding part of the work the author gives a summary of the conclusions which follow from the foregoing collection of facts. These are rendered more readily intelligible by means of a map. A short description of this will perhaps be the simplest way of indicating the general results at which the author has arrived. As its scale is comparatively small, details of mountain topography are omitted for the sake of distinctness; but the chief river courses are clearly shown, and the boundary between the mountain and lowland regions, north and south, is indicated by a thin dotted line. But all the ground above the 2600 metres contour-line (a very rough mean for the snow-line of the whole region) is shaded. Thus treated, we may remark in passing, the map gives an excellent idea of what would be the structure of a group of islands produced by the submergence of a mountain region, and a comparison of it with a map of the Lofoten Islands, or indeed with many parts of the Scandinavian and even North British coasts, is not without interest. The "isochional" levels, as perhaps they might be called, are indicated by a series of dotted lines, these being graduated in hundreds of metres, the zones included between them having the snow-line at heights differing by this amount. Obviously, this is only a rough representation of the facts, because, as the author carefully points out, there are numerous minor variations, even in one and the same district, due to the form or composition of the mountains, the aspect of the slope, and the like.

In the zone of 2500 metres, only a small portion of the Eastern Alps is included, viz. the higher summits of the northern limestone zone, such as the Zugspitz and the Dachstein. The southern limit of this district trends slightly north of east. The line limiting the zone of 2600 metres on the western side runs a little south of Landeck and Innsbruck, and so does not include any important summit; but east of the Brenner it has a rather southerly trend, and practically passes along the crest of the Höhe Tauern. The limit of the zone of 2700 metres runs roughly parallel with the last, till at the Glockner group it turns sharply to the south, and then, bending back, it passes to the south of the Adamello group. Thus the Brenta Alta group, the Marmolata and other peaks of the South Tyrol Dolomites, are in the 2700 metres zone, though a few summits of the Julian Alps, at the extreme east of the map, are marked 2600 metres. There is yet one other contour-line—that including the region where the snow-line is at 2900 metres or even more. This is rudely elliptical in shape, and includes the greater part of the Bernina, Ortler, and Oetzthal groups, together with many of the peaks on the left bank of the Upper Innthal. It is thus obvious that the snow-line is not wholly dependent on mountain form, or disposition, or on general temperature. The Adamello stands well to the south of the Oetzthal, yet its snow-line is full 100 metres lower. The northern part of the Oetzthal is only a very little south of the Glockner, yet the snow-line in the one district is 200 metres higher than in the other. But the configuration of the Oetzthal group is, if anything, more favourable to the accumulation of snow, and one would have expected, at first sight, to find the difference incline in the other direction. It is, then, evident that other climatic factors are of great importance, not the least of these being the amount of precipitation during the winter months. On this subject some interesting evidence is adduced.

The book is in clear good type, and the maps and sections at the end are printed with a blank space, equal to a page, on the inner side, so that they can be kept in sight when the book is read—a very convenient arrangement too often neglected. Most of the illustrations in the text are only diagrammatic sections, but the two "views" of the Gaisberg Glacier and of the Marmolata Glacier are excellent of their kind. The former is really no more than a "pen-and-ink sketch," yet it gives a very good idea of an Alpine view, and is far better than the wretched caricatures of mountain scenery which too often do duty in English scientific text-books. It may be commended to our publishers.

The second volume before us is one larger in size, characterized in parts by the same laborious minuteness but with little scientific value. It is the work of a geographer "pure and simple," and of one, as we suspect from internal evidence, who knows the Alps better from books than from personal experience. The larger half is devoted to Alpine topography, but this is often hardly more intelligible or interesting than a catalogue of names and altitudes. In our opinion Prof. Umlauft's plan of work is defective. At the outset, instead of impressing on the reader the relation of the Alps to the mountain ranges with which they are connected, he obscures it by an elaborate disquisition on their boundaries. The dominant physical features of the chain and its component ranges should have been at once sketched in bold outline, after which a more detailed description of the several districts might have been given. The reader would then have been furnished with a frame-work on which he could arrange the subordinate facts: now, unless previously familiar with the Alps, he will wander bewildered among a labyrinth of names and statistics. In short, Prof. Umlauft appears to be a geographer of the old school. If he has any scientific knowledge, whether as geologist or naturalist, this book affords not only no evidence in favour, but also not a little to the contrary.

For instance, in any notice of the geology of the Alps his statements are commonly unsatisfactory, and sometimes absurd. For the latter, perhaps, the translator is partly responsible; for occasionally a sentence occurs which is devoid of meaning, such as this, "Many of the lofty peaks are composed of Triassic limestones up to the metamorphic dachstein, which, inclosed in cardita, forms the peak." The paragraphs treating of valleys, lake basins, ice-caves, glaciers, erosion, and weathering, are all inadequate and unsatisfactory: all show traces of the unskilled compiler's hand. For example, in the chapter devoted to the last-named subject, the author, in speaking of "giants' caldrons," omits to state that the most remarkable examples, those, indeed, to which this name is commonly applied, and we think usually restricted, have been made by the action of streams which once plunged down the *moulins* of glaciers. It is quite true that these are not excluded by the author's words, but no hint of their occurrence is given, and no mention is made of the remarkable instance at the "glacier garden" near the Lion monument at Lucerne. It is difficult, without long quotations accompanied by a running commentary, to give an idea of the number of small defects or inaccuracies which abound in the book. We may, however, select, without actual quotation, the pages 127–36, which deal with the orography of the St. Gothard district. Here the Rhone glacier is said to be "over twenty miles long,"—probably fifteen would be nearer the mark. The "granite" of the table-land of the St. Gothard is "famed for its great crystals of feldspar." True, these crystals are fairly large, but not remarkable—much less than those occurring on the Lukmanier, which are often quite 3 inches long. Not the granite but the schist is famed "for the great number of minerals found in it." Among these minerals are enumerated various "zoolites" (zeolites), but neither albite, for which the St. Gothard is a rather noted locality, nor garnets, nor tremolite, nor actinolite, which are so abundant near the Val Tremola. One or two more slight inaccuracies, on which it is needless to dwell, may be noted in these pages.

Perhaps one of the most conspicuous instances will be found on p. 49, in a table of the eleven Alpine peaks which surpass 14,800 feet in height. First comes "Mont Blanc, highest point 15,779"; then, "*id.*, Mont Maudit, 15,651"; and third, "*id.*, Cour Mayeur (*sic*), 15,602." This is misleading. It is quite true that the actual summit of Mont Blanc lies a little north of a slight prominence which from Courmayeur appears to be the summit. The latter, however, is not a separate peak in any respect comparable with the Mont Maudit. It is a case very similar to the "Wengern Jungfrau" and the true summit, and on this principle separate peaks might be manufactured to any extent in the Alps. Further down is a more serious error. We find "Mischabelhörner, Täschhorn, 14,972 feet"; and a little lower in the list, "Mischabelhörner, Grabhorn, 14,949 feet." But the latter, more usually called the Grabenhorn or Dom, is the higher peak, as is correctly stated elsewhere in the volume, though there the altitudes given are not the same. There is yet another error. The author enumerates three of the actual peaks of Monte Rosa; then at the end of the list he places "Monte Rosa, Lyskamm, 14,887 feet," and "*id.*, Weisshorn, 14,804 feet." But the Lyskamm is always regarded as a separate mountain, and the depression between the two, crossed by the well-known Lysjock, though it is only 800 or 900 feet lower, is so wide and well marked as to justify the separation. But to rank the Weisshorn as a peak of Monte Rosa is hopelessly indefensible. The mountains are more than ten miles apart as the crow flies, and separated by the deep trench of the Vispthal.

One rather short chapter is devoted to the fauna and flora of the Alps, and the information there given is extremely scanty, and not seldom inaccurate. For example, the rhododendrons only appear under the vague and misleading trivial name of the "Alpine rose," and it is not even hinted that there is a true *Rosa alpina*. Heaths, again, are hardly to be enumerated among the higher Alpine plants, and azaleas are only represented by the abundant but very inconspicuous *Azalea procumbens*. The account of the fauna is equally unsatisfactory. The chamois receives only a passing mention, and is not enumerated among the animals frequently found above the snow-line. The steinbock (*Capra ibex*) is briefly alluded to under the name of the "wild goat." The birds are vaguely enumerated, and, while undue prominence is given to some, others, which as a rule especially attract the traveller's notice, are passed over in silence. The insects are almost wholly neglected; yet, without entering into many scientific details, it might have been possible to give some idea of the crowds of little blue butterflies (*Polyommatus*) that flutter about the puddles on the pathways, of the coppers (*Lycæna*), ringlets (*Hipparchia*), fritillaries (*Argynnis* and *Melitæa*), clouded-yellows (*Colias*), and Apollos (*Parnassius*), which impress the traveller accustomed only to the European lowlands, when first he rambles among the true Alpine regions. It would be easy to name more than one similar work, by no means of recent date, which in this respect is far superior to Prof. Umlauft's.

The illustrations are numerous, but rather unequal in quality. Some are fairly good, but frequently, while accurate in general effect, having probably been engraved from photographs, they are defective in character. A glance at the representation of the gorge of the Tamina on p. 43, or that of Monte Cristallo from the Dürrensee (facing p. 86), will indicate the nature of our objection. The rocks might be moulded from plaster or canvas. There is, however, a very clearly printed geological map of the Alps, which appears to us generally accurate, though we doubt the correctness of placing a considerable patch of Silurian and Devonian about the upper part of the Brenner Pass. T. G. BONNEY.

THE PLANTING AND AGRICULTURAL INDUSTRIES OF CEYLON.

Review of the Planting and Agricultural Industries of Ceylon, and Statistics of the Planting Enterprises in India and the Colonies. By J. Ferguson. Pp. 168. (Colombo: A. M. and J. Ferguson, 1888.)

THIS is a reprint, in the form of a small octavo volume, of information contained in Ferguson's "Ceylon Hand-book and Directory," specially relating to the tropical cultures of Ceylon. It affords much authentic information in a handy and accessible form, and is a valuable summary of the results attained in the cultivation of most economic plants suited to a tropical country. Ceylon itself is a singularly interesting island. It is usually described as the largest, most populous, and most important of the Crown Colonies of Great Britain. It has in recent years become the seat of planting industries which have in one or two instances almost monopolized the markets of the world. It is six times the size of Jamaica, and about five-sixths the size of Ireland. Of its sixteen million acres, at present only about three millions are under cultivation, and these support a population of exactly the same number. The value of the imports and exports amounts to about ten millions sterling. The total number of European residents in Ceylon is under five thousand, while the mixed or coloured population called Eurasians or Burghers amounted to about nineteen thousand. The bulk of the population, amounting to nearly two million souls, is composed of Sinhalese—a remarkably tractable and inoffensive people—while the remainder is made up of Tamils, Moormen, Malays, and Veddahs. The latter are an aboriginal race, comparatively few in number, inhabiting the forests of the north-east.

Although the number of the Sinhalese is relatively so large, they contribute very little to the labour supply of the European plantations. Plantation labour is furnished by Tamil coolies from Southern India. According to a Report published by the Government of Madras, out of a population of thirty-five millions of human beings in that Presidency there are sixteen millions whose annual earnings do not average more than £3 12*s.*, or a little over 2½*d.* per day. Thus it is that the plantations of Ceylon, paying about 6*d.* or 9*d.* per day, are abundantly supplied with cheap free labour.

The purely European enterprises consist of tea, coffee —both Arabian and Liberian—cacao, cardamoms, rubber, annatto, vanilla, pepper, fibres, nutmeg, cloves, dye-plants. In these is invested English capital to the amount of about eight millions sterling. The native industries are associated with the cultivation of the cocoa-nut palm—yielding oil, coir, and copra—rice, cinnamon, palmyra palm, kitul or jaggery palm, areca palm citronella and lemon grass, tobacco, cotton, sugar-cane, dry grains such as kollu, millet, kurakkan, maize, and numerous vegetables and fruits. It is estimated that there are nearly fifty million cocoa-nut palms in Ceylon, and the yearly yield cannot be less than about 500 million nuts. Next to the cocoa-nut palm, the palmyra palm (*Borassus flabelliformis*) is regarded as one of the richest plants known. According to a Tamil proverb, "It lives for a lac of years after planting, and lasts for a lac of years when felled." Jaggery sugar is made from the sap, and in the dry, arid regions of the north-east of Ceylon more than seventy million nuts are annually produced. The young sprouting nuts are used as a vegetable. The kitul (*Caryota urens*) is another sugar-palm, which, in addition, yields a coarse black fibre used in broom-making. Cinnamon is essentially a native industry. The island has been famous for this spice "from the dawn of historical records." There is a Sinhalese caste of cinnamon peelers, and these, the Chaliyas, hold practically a monopoly in preparing the bark for the market. The dry grain cultivation is associated with that baneful *chena* practice of recklessly cutting down and burning virgin forests—now, we are glad to notice, in course of being kept within proper bounds. The natives of Ceylon have imitated the Europeans in many industries, but by far the greater number are content to follow in the footsteps of their ancestors, and cultivate only such plants as cocoa-nuts, rice, fruits, and vegetables, necessary to supply their daily wants.

For many years the chief European industry was that of coffee. From 1825, when Sir Edward Baines started the first upland coffee plantation near Kandy, to 1875, when Ceylon exported nearly a million hundredweights, "coffee was king." In 1869, a microscopic fungus (*Hemeleis vastatrix*) made its appearance on the leaves of the coffee-plant. This spread with such rapidity, and with such destructive effect, that within a few years the Ceylon coffee plantations were doomed. The disease extended also to Southern India, to Sumatra, and Java; it invaded Mauritius, Madagascar, and Natal, and reached even the young and promising plantations of Fiji. After twenty years' experience of this pest, the Ceylon coffee plantations have so dwindled that the present exports are only one-tenth of what they once were. Fortunately the decline of coffee was accompanied by the extension of cultivation of cinchona, cardamoms, cacao, and tea Ceylon cinchona has been produced in such quantities that the markets have been completely glutted. In consequence the price of bark has fallen so low that the cultivation is unremunerative. The attention of Ceylon planters is now being concentrated, with their accustomed energy, on the cultivation of tea. Coffee, cinchona, and everything not immediately remunerative are being uprooted to give place to the new staple. Although the industry is not more than ten or twelve years old, Ceylon tea is already being exported to the value of £600,000. Tea therefore bids fair to take the place of coffee, and thus the cloud which has overshadowed the prosperity of the island during the last few years is gradually passing away. Ceylon cacao is excellent, but the industry is small and apparently stationary. It is doubtful whether the island possesses